

Atherosclerosis Predictor?

Circulating Levels of POPs Linked to Arterial Effects

Persistent organic pollutants (POPs) are long-lived environmental contaminants that are widely detected in humans. Elevated circulating levels of POPs have been linked to hypertension, obesity, diabetes, metabolic syndrome, and myocardial infarction in humans. Atherosclerosis, characterized by lipid-rich plaques on the inner wall (intima) of the artery, also can lead to myocardial infarction and stroke. A new study now shows an association between increased circulating levels of POPs and markers of atherosclerosis in the carotid artery [*EHP* 120(1):38–43; Lind et al.].

Atherosclerosis begins with low-density lipoprotein cholesterol accumulating beneath the intima. As the cholesterol undergoes oxidation, chronic inflammation leads to long-term arterial damage. Atherosclerosis is often accompanied by a thickening of the intima and the muscular layer, or media, of the artery. Increased intima-media thickness (IMT) and decreased echogenicity, or density, of the intima-media complex also predict future disease.

The current study drew on data from the Prospective Investigation of the Vasculature in Uppsala Seniors, a Swedish study involving 1,016 70-year-old men and women. Twenty-three POPs were measured in the participants' blood, including 16 polychlorinated biphenyl (PCB) congeners, 5 pesticides, 1 dioxin, and 1 brominated compound. Twenty-one POPs were found in at least 90% of the participants.

Participants underwent ultrasound examination of their carotid arteries for plaque detection and IMT measurement. Ultrasound images were also used in gray-scale computer analysis to determine the echogenicity of the intima-media complex. Several individual PCB congeners as well as the sum of PCB congeners were associated with plaque presence, and highly chlorinated PCBs were inversely associated with echogenicity of the intima-media complex. The sum of the toxic equivalents of the PCBs and the dioxin also was inversely associated with echogenicity and positively associated with IMT. The relationships remained significant even after controlling for multiple confounding factors, including known cardiovascular risk factors.

This study builds upon earlier findings of an association between increased circulating levels of POPs and myocardial infarction. The results also suggest that POPs have vascular effects that are independent of known risk factors for atherosclerosis, potentially affecting the development of atherosclerosis at several points, e.g., through altered expression of genes related to inflammation. Given the restricted study population, the findings cannot be generalized to more ethnically diverse groups of different ages. Prospective studies are needed to examine the suggested effects of POPs on myocardial infarction risk.

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Big Biking Payoff

Alternative Transportation Could Net Midwest over \$8 Billion

A New Year's resolution to bike rather than drive for short trips could improve both personal health and regional air quality. A team led by researchers from the University of Wisconsin at Madison is the first to quantify these benefits in the United States to show they may have a significant economic payoff [*EHP* 120(1):68–76; Grabow et al.].

In 2010 another team concluded that the health benefits of biking substantially outweigh the risks posed by accidents and exposure to pollution based on a literature review comparing the use of cars and bikes for trips under 5 miles [*EHP* 118(8):1109–1116]. The new study expands that concept by combining data on transportation,

automotive emissions, and health effects of exposure to air pollution to estimate how switching to biking for round trips under 5 miles could impact both air quality and health care costs. Short trips contribute disproportionately to air pollution because a large fraction of toxic automotive emissions, including 25% of the volatile organic compounds (VOCs) and 19% of the primary fine particulate matter (PM_{2.5}), are generated in the first few miles of travel before pollution control devices have reached their operating temperatures.

The new study focused on 11 urban and suburban Metropolitan Statistical Areas in Illinois, Indiana, Ohio, Michigan, Minnesota, and Wisconsin. The model for air-quality improvement assumed that car use for all trips of 5 miles or less round trip from April through October were replaced by an alternative means of transportation such as walking, biking, or mass transit. The model for health benefits assumed that 50% of these short trips were taken by bicycle.

Under these conditions the authors project that annual average urban PM_{2.5} concentrations would decline by 0.1 µg/m³. Estimating effects of vehicle emissions on ground-level ozone is less straightforward; because VOCs can limit the production of ozone in urban areas, reducing automotive emissions (and thus VOC concentrations) would slightly increase ozone in most cities. But the nonlinear interplay of emissions and meteorology in atmospheric chemistry and transport means reductions in automotive VOCs and nitrogen oxides would still reduce ozone at a regional level.

The models pegged the net health benefit from improved air quality—a benefit that extends beyond city limits—at \$4.94 billion per year. The \$3.8 billion in estimated annual health benefits that urbanites would accrue from biking were the result of avoided mortality and reduced health care costs through increased physical activity.

Strengths of the study include its cross-disciplinary focus and use of up-to-date models incorporating highly localized emissions and travel data. Although the study acknowledges the health costs associated with car and bike crashes as well as the benefits of increased walking to public transportation, it does not attempt to quantify them.

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Using a bike for short trips may offer health benefits at multiple levels.